CLAIMS

1. An electrical conductor comprising transparent electrically conductive material and at least one conductive track formed from electrically conductive particles and providing a source or sink for electrical charge transport to and from the transparent material.

2. An electrical conductor according to Claim 1, wherein the electrically conductive particles are nanoparticles.

3. An electrical conductor according to Claim 2, where the nanoparticles have a mean maximum cross-sectional dimension less than 1000 nm.

4. An electrical conductor according to Claim 2 or 3, where the nanoparticles have a mean maximum cross sectional dimension less than 100 nm, preferably less than 20 nm.

5. An electrical conductor according to any preceding claim, being formed on a substrate, wherein the transparent electrically conductive material and/or a fluid comprising the electrically conductive particles is selectively deposited on the substrate using a drop-on-demand printing technique.

6. An electrical conductor according to any preceding claim, wherein the electrically conductive particles are deposited on the or a substrate and are treated after deposition so as to increase the electrical conductivity of said at least one track.

7. An electrical conductor according to Claim 5, wherein the deposited electrically conductive particles are caused to form said at least one conductive track, said at least one conductive track being a continuous, discrete, conductive track.

8. An electrical conductor according to any preceding claim, wherein the track is formed by at least one of sintering, melting, and annealing of at least some of the electrically conductive particles.

9. An electrical conductor according to any preceding claim for use in a display device, wherein said at least one conductive track is of such a size as to not be visible to a user during operation of the display device.

10. An electrical conductor according to any preceding claim, wherein said at least one conductive track has a width equal to or less than 100 microns and preferably equal to or less than 50 microns.

11. An electrical conductor according to preceding claim for use in a display device, wherein said transparent electrically conductive material is adapted to be aligned with a pixel of said display device and preferably said electrical conductor is adapted to act as a source or sink of electrical charge so as to activate or deactivate said pixel.

12. An electrical conductor according to any preceding claim, wherein the at least one conductive track defines a window, and preferably the transparent electrically conductive material is deposited within said window using the technique of drop-on-demand printing.

13. An electrical conductor comprising at least one conductive track formed on a substrate and transparent electrically conductive material, said at least one conductive track providing a source or sink for electrical charge transport to and from the transparent material, wherein said at least one conductive track defines a window at least partially surrounded by said track and said transparent material is deposited within said window using the technique of drop-on-demand printing.

14. An electrical conductor according to Claim 13, wherein said at least one conducting track is formed on the substrate using a lithographic printing technique.

15. An electrical conductor according to Claim 13, wherein said at least one conducting track is formed on the substrate using a plating technique.

16. An electrical conductor according to any of Claims 12 to 15, wherein said at least one conducting track provides a containment well for the transparent material.

17. An electrical conductor according to any of Claims 12 to 16, wherein a single layer of transparent material is deposited within said window.

18. An electrical conductor according to any of Claims 12 to 17, wherein a plurality of layers of transparent material are deposited within said window.

19. An electrical conductor according to any preceding claim, wherein the track is formed from electrically conductive material which, when oxidised, has increased transparency, and said transparent electrically conductive material is formed by selectively oxidising portions of said track.

20. An electrical conductor comprising at least one conductive track formed on a substrate and transparent electrically conductive material, the track providing a source or sink for electrical charge transport to and from the transparent material and said transparent electrically conductive material being formed by selective oxidation of at least one portion of said track.

21. An electrical conductor according to Claim 19 or 20, wherein said selective oxidation comprises ultra-violet oxidation.

22. An electrical conductor according to any of Claims 19 to 21, wherein said selective oxidation is carried out by application of laser radiation or LED radiation, preferably in an oxidising environment.

23. An electrical conductor according to any preceding claim, wherein the transparent material comprises at least one of a transparent conductive oxide and a transparent polymer.

24. An electrical conductor according to any preceding claim, wherein the transparent electrically conducting material has dispersed therein further electrically conductive particles, said further electrically conductive particles having a higher conductivity than the transparent material.

25. An electrical conductor according to any preceding claim, wherein the electrically conductive particles are metallic, preferably at least one of silver, gold, copper, aluminium, tin, zinc, lead, indium, molybdenum, nickel, platinum and rhodium particles.

26. An electrical conductor according to any preceding claim, wherein at least part of the conductor has a transparency greater than 70%, preferably greater than 80%, at 550 nm wavelength.

27. An electrical conductor according to any preceding claim, wherein the at least one conductive track at least partially surrounds the transparent electrically conductive material.

28. An electrical conductor according to any preceding claim, wherein said at least one track and the transparent material partially overlap.

29. An electrical conductor according to any preceding claim, wherein said at least one track directly contacts the transparent material.

30. An electrical conductor according to any preceding claim, comprising further, electrically conductive material disposed between said at least one track and the transparent material.

31. An electrical conductor according to any preceding claim disposed on a transparent substrate.

32. An electrical conductor according to Claim 30, comprising further transparent material located between the substrate and the transparent electrically conductive material.

33. An electrical conductor according to any preceding claim, wherein said at least one conductive track is of lower transparency than the transparent material at 550 nm wavelength.

34. An electrical conductor according to any preceding claim, wherein the transparent material is deposited over said at least one conductive track.

35. An electrical conductor according to any preceding claim, wherein the electrically conductive material comprises a metal with a lower melting temperature than that of the transparent material.

36. An electrical conductor according to any preceding claim, wherein at least one of the conductive track and the transparent electrically conductive material is formed using nanotectics.

37. An electrical conductor according to any preceding claim, wherein said electrically conductive particles are deposited within grooves formed on a substrate, preferably so as to partially fill the grooves.

38. An electrical conductor according to Claim 36, wherein the grooves are formed in a coating formed on the substrate.

39. An electrical conductor according to Claim 35 or 36, wherein the grooves are formed by laser ablation.

40. An electrical conductor according to any preceding claim, wherein said at least one conductive track is formed in an interdigitated pattern.

41. A method of fabricating an electrical conductor, comprising forming on a substrate a region of transparent electrically conductive material and at least one conductive track, said at least one conductive track being formed from electrically conductive particles and providing a source or sink for electrical charge transport to and from the transparent material.

42. A method according to Claim 41, wherein the electrically conductive particles are nanoparticles.

43. A method according to Claim 42, wherein the nanoparticles have a mean maximum cross-sectional dimension less than 1000 nm.

44. A method according to Claim 42 or 43, where the nanoparticles have a mean maximum cross sectional dimension less than 100 nm, preferably less than 20 nm.

45. A method according to any of Claims 41 to 44, comprising selectively depositing the transparent electrically conductive material and/or a fluid comprising the electrically conductive particles on the substrate using a drop-on-demand printing technique.

46. A method according to any of Claims 41 to 45, comprising depositing the electrically conductive particles on the substrate and treating the electrically conductive particles after deposition so as to increase the electrical conductivity of said at least one track.

47. An electrical conductor according to Claim 45, comprising causing the deposited electrically conductive particles to form said at least one conductive track, said at least one conductive track being a continuous, discrete, conductive track.

48. A method according to any of Claims 41 to 47, comprising forming the track by at least one of sintering, melting, and annealing.

49. A method according to any of Claims 41 to 48, wherein the electrical conductor is adapted to be used in a display device, and said at least one conductive track is of such a size as to not be visible to a user during operation of the display device.

50. A method according to any of Claims 41 to 49, wherein said at least one conductive track has a width equal to or less than 100 microns and preferably equal to or less than 50 microns.

51. A method according to any of Claims 41 to 50, comprising aligning said transparent electrically conductive material with a pixel of a display device, and preferably arranging said electrical conductor to act as a source or sink of electrical charge so as to activate or deactivate said pixel.

52. A method according to any of Claims 41 to 51, comprising forming the at least one conductive track so as to define a window, and preferably depositing the transparent electrically conductive material within said window using the technique of drop-on-demand printing.

53. A method of fabricating an electrical conductor, comprising selectively forming on a substrate at least one conductive track defining a window at least partially surrounded by said track, and subsequently using the technique of drop-on-demand printing to deposit transparent electrically conductive material within said window, the track providing a source or sink for electrical charge transport to and from the transparent material.

54. A method according to Claim 53, wherein said at least one conducting track is formed on the substrate using a lithographic printing technique.

55. A method according to Claim 53, wherein said at least one conducting track is formed on the substrate using a plating technique.

56. A method according to any of Claims 52 to 55, wherein said at least one conducting track provides a containment well for the transparent material.

57. A method according to any of Claims 52 to 56, wherein a single layer of transparent material is deposited within said window.

58. A method according to any of Claims 52 to 56, wherein a plurality of layers of transparent material are deposited within said window.

59. A method according to any of Claims 41 to 58, wherein the track is formed from electrically conductive material which, when oxidised, has increased transparency, and said transparent electrically conductive material is formed by selectively oxidising portions of said track.

60. A method of fabricating an electrical conductor comprising forming on a substrate at least one conductive track and a region of transparent electrically conductive material, the track providing a source or sink for electrical charge transport to and from the transparent material and said region of transparent electrically conductive material being formed by selective oxidation of at least one portion of said track.

61. A method according to Claim 59 or 60, wherein said selective oxidation comprises ultra-violet oxidation.

62. A method according to any of Claims 59 to 61, wherein said selective oxidation is carried out by application of laser radiation or LED radiation, preferably in an oxidising environment.

63. A method according to any of Claims 41 to 62, wherein the transparent material comprises at least one of a transparent conductive oxide and a transparent polymer.

64. A method according to any of Claims 41 to 63, wherein the transparent electrically conducting material has dispersed therein further electrically conductive particles, said further electrically conductive particles having a higher conductivity than the transparent material.

65. A method according to any of Claims 41 to 64, wherein the electrically conductive particles are metallic, preferably at least one of silver, gold, copper, aluminium, tin, zinc, lead, indium, molybdenum, nickel, platinum and rhodium particles.

66. A method according to any of Claims 41 to 65, wherein at least part of the conductor has a transparency greater than 70%, preferably greater than 80%, at 550 nm wavelength.

67. A method according to any of Claims 41 to 66, wherein the at least one conductive track at least partially surrounds the transparent electrically conductive material.

68. A method according to any of Claims 41 to 67, wherein said at least one track and the transparent material partially overlap.

69. A method according to any of Claims 41 to 68, wherein said at least one track directly contacts the transparent material.

70. A method according to any of Claims 41 to 69, comprising providing further, electrically conductive material between said at least one track and the transparent material.

71. A method according to any of Claims 41 to 70, wherein the substrate is a transparent substrate.

72. A method according to Claim 71, comprising providing further transparent material between the substrate and the transparent electrically conductive material.

73. A method according to any of Claims 41 to 72, wherein said at least one conductive track is of lower transparency than the transparent material at 550 nm wavelength.

74. A method according to any of Claims 41 to 73, comprising depositing the transparent material over said at least one conductive track.

75. A method according to any of Claims 41 to 74, wherein the electrically conductive material comprises a metal with a lower melting temperature than that of the transparent material.

76. A method according to any of Claims 41 to 75, wherein at least one of the conductive track and the transparent electrically conductive material is formed using nanotectics.

77. A method according to any of Claims 41 to 76, wherein said electrically conductive particles are deposited within grooves formed on a substrate, preferably so as to partially fill the grooves.

78. A method according to Claim 77, wherein the grooves are formed in a coating formed on the substrate.

79. A method according to Claim 77 or 78, wherein the grooves are formed by laser ablation.

80. A method according to any preceding claim, comprising forming said at least one conductive track in an interdigitated pattern.

81. An electrical conductor according to any of Claims 1 to 40, wherein the transparent electrically conductive material is translucent electrically conductive material.

82. A method according to any of Claims 41 to 80, wherein the transparent electrically conductive material is translucent electrically conductive material.

83. Apparatus for forming an electrical conductor comprising means for depositing transparent electrically conductive material on a substrate, and means for depositing electrically conductive particles on the substrate so as to form at least one conductive track, said conductive track providing a source or sink for electrical charge transport to and from the transparent material.

84. Apparatus according to Claim 83, wherein said means for depositing said transparent electrically conductive material and/or said means for depositing electrically conductive particles comprises a printhead adapted to carry out a drop-on-demand printing technique.

85. Apparatus according to Claim 83 or 84 comprising means for treating said transparent electrically conductive material and/or said electrically conductive particles, preferably after deposition.

86. Apparatus according to Claim 85, wherein said treating means comprises means for at least one of melting, sintering, and annealing.

87. Apparatus according to Claim 84 or 85, wherein said treating means comprises a laser, preferably mounted on the or a printhead.

88. A display device comprising at least one pixel and an electrical conductor according to any of Claims 1 to 40, wherein the transparent electrically conductive material is aligned with said at least one

pixel and preferably the electrical conductor acts as a source or sink of electrical charge so as to activate or deactivate said at least one pixel.

89. A method of fabricating an electrical device, comprising depositing using a drop-on-demand printing technique an electrical conductor comprising transparent electrically conductive material having dispersed therein electrically conductive particles formed from material having a higher conductivity than the transparent material.

90. A method of forming an electronic device comprising arranging a surface such that deposition material deposited on a receiving portion of the surface will flow to a desired portion of the surface.